GEOTECHNICAL ENGINEERING REPORT

Proposed Walmart Expansion #2403
310 31st Avenue Southeast
Puyallup, Washington 98374

Prepared for

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PSI Project No. 07041419

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1 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

The following report presents the results of PSI's geotechnical investigation performed for the proposed Walmart Store #2403 expansion located at 310 31st Avenue Southeast in Puyallup, Washington. A Site Vicinity Map is presented in Figure 1. This investigation was performed for Galloway and Company, Inc, (Galloway) in general accordance with PSI proposal number 0704-353378, dated September 5, 2021. Project authorization was provided by Mr. Ryan James of Galloway in an email September 10, 2021.

1.2 PROJECT DESCRIPTION

Project information was provided by Mr. Ryan James, in an email dated September 3, 2021. The provided information included the following:

- A Utility Plan Titled "Walmart, Puyallup, WA", dated June 30, 2005 by Pacland

Based on the provided information, PSI understands the improvements at the existing Walmart store will include a 3,500 square foot addition on shallow foundations located at the southwest corner of the existing Walmart Superstore. Structural loads planned were not provided, however, based on similar projects, PSI estimates column and wall loads will be on the order of a maximum of 100 kips and 2 kips per linear foot, respectively. The ground floor will remain at grade and consist of a reinforced concrete slab with floor loads less than 150 psf.

Should any of the above information or design basis made by PSI be inconsistent with the planned construction, it is requested that you contact us immediately to allow us to make any necessary modifications to this report. PSI will not be held responsible for changes to the project if not provided the opportunity to review the information and provide modifications to our recommendations.

1.3 PURPOSE AND SCOPE OF SERVICES

Based on correspondence with Mr. Ryan James and PSI proposal number 0704-353378, the purpose of this exploration was to evaluate the subsurface at the site and to develop geotechnical foundation design criteria for support of the proposed addition.

The scope of the exploration included a reconnaissance of the project site and completion of two test borings using hollow stem auger drilling methods. The project analysis included laboratory testing of samples collected from the borings, an engineering analysis and evaluation of the subsurface materials encountered, and preparation of this report.

2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The site is located at 310 31st Avenue Southeast in Puyallup, Washington. It consists of a single parcel that contains Walmart Store #2403 and its associated parking and drive lanes. The site is bound on all sides by commercial and residential properties. Highway 512 is located to the west and Bradley Lake is located to the east.

2.2 TOPOGRAPHY

Based on The National Map developed by the United States Geological Survey, the property for the existing Walmart is relatively flat, at an elevation of about 440 to 443 feet (NAVD88). In the location of the proposed addition, the elevation is approximately 443 feet.

2.3 GEOLOGY

Based on a review of soils on the United States National Geologic Map Database, the site is mapped as Pleistocene glacial recessional outwash consisting of silt, clay, sand, and gravel.

2.4 GROUNDWATER

Groundwater was observed during drilling processes in boring B1 and B2 at a depth of approximately 18 feet bgs. Based on a review of public well log information from the Washington Department of Natural Resources, groundwater was anticipated to be 20 to 25 feet below grade

2.4.1 LOCAL FAULTING AND SEISMIC DESIGN PARAMETERS

PSI has reviewed the USGS Quaternary Fault and Fold Database of the United States and the following have been mapped within about 15 miles of the project site.

Table 1 – Local Faulting

Fault	Distance (Miles)
Tacoma Fault Zone	6.3, North

Based on site explorations and geologic mapping, we recommend using Site Class D to evaluate the seismic design of the structure. Site coefficients and spectral acceleration parameters for structural design are provided in Table 1.

Table 2 - Seismic Design Parameters
(47.16012° N, 122.28943° W) – SITE CLASS D

ASCE 7-16 CODE BASED RESPONSE SPECTRUM MCER GROUND MOTION - 5% DAMPING 1% IN 50 YEARS PROBABILITY OF COLLAPSE	
S_S	1.126
S_1	0.435
MAPPED MAXIMUM CONSIDERED EARTHQUAKE SPECTRAL RESPONSE ACCELERATION PARAMETER (SITE CLASS D)	
F_A	1.2
F_V	Null – See Section 11.4.8
S_{MS}	1.513
S_{M1}	Null – See Section 11.4.8
DESIGN SPECTRAL RESPONSE ACCELERATION PARAMETER	
S_{DS}	1.009
S_{D1}	Null – See Section 11.4.8

Notes: S_S = Short period (0.2 second) Mapped Spectral Acceleration
S_1 = 1.0 second period Mapped Spectral Acceleration
S_{MS} = Spectral Response adjusted for site class effects for short period = $F_A \bullet S_S$
S_{M1} = Spectral Response adjusted for site class effects for 1-second period = $F_v \bullet S_1$
S_{DS} = Design Spectral Response Acceleration for short period = $2/3 \bullet S_{MS}$
S_{D1} = Design Spectral Response Acceleration for 1-second period =$2/3 \bullet S_{M1}$
F_A = Short Period Site Coefficients
F_V = Long Period Site Coefficients

2.4.2 GEOLOGIC HAZARDS

The following table presents a qualitative assessment of geologic hazards considering the site class, the subsurface soil properties, the groundwater elevation, and probabilistic ground motions:

Table 3 – Qualitative Seismic Site Assessments

Liquefaction	Low	Based on the subsurface conditions encountered in the soil borings drilled on site, the area has a low risk of liquefaction.
Earthquake Shaking	Strong	The area is mapped as being in a zone of Strong Earthquake Shaking, based on the Seismic Response of the Washington Geologic Information Portal.
Slope Stability	Low	The site and surrounding areas are relatively flat and thus are at low risk of landslide.
Surface Rupture	Low	No known active faults underlie the site, based on the USGS Quaternary Faults Map

2.5 SUBSURFACE CONDITIONS

A detailed description of the Field Exploration Program can be found in Appendix A. Laboratory test results are presented on the exploration logs and in detail in Appendix B.

In borings B1 and B2, three inches of asphalt was observed overlying three inches of aggregate base rock. Subsurface conditions at the site generally consist of poorly graded gravelly sand with trace silt. Based on SPT blow counts, the sand had a relative density of medium dense to vary dense and moisture percentages of 7 to 29%. The sand extended to the termination depth of 26½ feet in boring B1. Underlying the sand at a depth of 20 feet bgs in boring B2 is poorly grade sandy gravel with trace silt. The gravel had a relative density of very dense and extended to the termination depth of 26½ in boring B2.

3 GEOTECHNICAL RECOMMENDATIONS

In our opinion, the proposed Walmart addition can be supported on shallow foundations, provided the geotechnical engineering recommendations in this report are followed.

3.1 SITE PREPARATION

PSI recommends that organics, loose, and otherwise unsuitable soils at the project site be stripped and removed from the building areas. Buried piping, where encountered, must be completely removed and rerouted from below proposed building foundations. Concrete structures and remnants of previous structures encountered during site excavation and site construction operations should be completely removed beneath the planned foundations and replaced with an engineered fill.

After the surficial materials have been stripped and completely removed from proposed development areas, PSI should observe the subgrade to identify any loose or unsuitable areas. Where organic, loose, or otherwise unsuitable soils are identified, within structural areas of the project, these soils should be completely removed and replaced with structural fill.

3.2 WET WEATHER CONSTRUCTION

It has been PSI's experience that during warm, dry weather, the moisture content of the upper few feet of soil will decrease; however, below the upper few feet, the moisture content of the soil tends to remain relatively unchanged and often well above the optimum moisture content for compaction.

As a result, the subcontractor must use care to protect exposed subgrade from disturbance by construction traffic, particularly during wet weather. The Contractor must employ construction equipment and procedures that prevent disturbance and softening of the subgrade soils. The use of excavation equipment equipped with smooth-edged buckets for excavation with the concurrent placement of granular work pads tends to minimize the potential for subgrade disturbance.

3.3 EXCAVATION CONSIDERATIONS

Open excavations exceeding four feet are not anticipated; however, if they do occur, excavations should be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor should evaluate the soil exposed in the excavations as part of the required safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified by local, state, and federal safety regulations. PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations. Temporary excavations above the water table can be sloped at 1H:1V.

3.4 STRUCTURAL FILL MATERIALS

3.4.1 GENERAL

Structural fill materials should be compacted to at least 95% of the maximum dry density, at a moisture content within about 3% of optimum, as determined by ASTM D1557. Coarse granular fill should be compacted until well keyed. No brush, roots, construction debris, or other deleterious material should be placed within the structural fills. The earthwork contractor's compactive effort should be evaluated based on field observations, and lift thicknesses should be adjusted accordingly to meet compaction requirements. Additional information regarding specific types of fill is provided below.

3.4.2 IMPORTED GRANULAR FILL

Imported granular fill materials should consist of sand, gravel, or fragmental rock with a maximum size on the order of 4 inches and with not more than 8% passing the No. 200 sieve (washed analysis). Material satisfying these requirements can usually be placed during periods of wet weather. The first lift of granular fill placed over a fine-grained subgrade should be about 18 inches thick and subsequent lifts about 12 inches thick when using medium to heavy weight vibratory rollers. Granular structural fill should be limited to a maximum size of about 1½ inches when compacted with hand-operated equipment. We also recommend that lift thicknesses be limited to less than 8 inches when using hand-operated vibratory plate compactors.

3.4.3 UTILITY TRENCH BACKFILL

Utility trench backfill should consist of granular fill limited to a maximum size of about 1½ inches. The granular trench backfill should be compacted to at least 95% of the maximum dry density as determined by ASTM D1557 in the upper 4 feet of the trench and to at least 90% of this density below this depth. Lift thicknesses should be evaluated based on field density tests; however, particular care should be taken when operating hoe-mounted compactors to prevent damage to the newly placed conduits. Flooding or jetting to compact the trench backfill should not be permitted.

3.5 FOUNDATION RECOMMENDATIONS

3.5.1 SPREAD FOOTINGS

Based on the loads discussed earlier in this report, the proposed structure can be supported on conventional spread footing foundations constructed in accordance with the following design criteria. Footings should be established at a minimum depth of 1½ feet below the lowest adjacent finished grade. In addition, isolated column and continuous footings should have a minimum width of at least 3 and 1½ feet, respectively.

We recommend the use of a smooth-edged excavator to make the footing excavations. A geotechnical engineer should observe the footing subgrade at the time of excavation and prior to placing the reinforcing steel and concrete. Footings established in accordance with these criteria can be designed on the basis of an allowable soil bearing pressure of 3,000 psf. This value applies to the total of dead load plus frequently and/or permanently applied live loads and can be increased by one third for the total of all loads; dead, live, and wind or seismic.

If fill and/or other unsuitable soils are encountered at footing depth, the unsuitable material should be over excavated to firm subgrade material and replaced with granular structural fill. The total width of the over excavation area beneath the design footing elevation should be increased one foot in plan area for every foot of depth of over excavation. The over excavated areas should be backfilled with clean crushed rock and compacted to at least 95% of the maximum dry density as determined by ASTM D1557.

Horizontal shear forces can be resisted partially or completely by frictional forces developed between the base of spread footings and the underlying soil. The total shearing resistance between the foundation footprint and the soil can be computed as the normal force, i.e., the sum of all vertical forces (dead load plus real live load), times the coefficient of friction equal to 0.40 (ultimate value). If additional lateral resistance is required, passive earth resistance against embedded footings or walls can be computed using a pressure based on an equivalent fluid with a unit weight of 300 pcf. This design passive earth pressure assumes granular structural fill is used to backfill the footing excavation or the footings will be neat formed in situ.

3.5.2 SHALLOW FOUNDATION CONSTRUCTION CONSIDERATIONS

The foundation excavations should be observed by a representative of PSI prior to steel or concrete placement to assess that the foundation materials are consistent with the materials discussed in this report. Soft or loose soil zones encountered at the bottom of the footing excavations should be recompacted or removed and replaced with properly compacted structural fill as directed by the geotechnical engineer. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with dense graded compacted crushed stone.

After opening, footing excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface runoff water should be drained away from the excavations and not be allowed to pond. If possible, the foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, the soils in the excavation should be protected to reduce evaporation or entry of moisture.

3.5.3 FLOOR SLAB SUPPORT

PSI recommends the slab-on-grade be underlain by at least 8 inches of angular, free-draining rock with less than 5% fines. The drain rock should be compacted until it is well keyed. In addition, it may be appropriate to install a durable vapor-retarding membrane to limit the risk of damp floors in areas that will have moisture-sensitive materials placed directly on the floor. The vapor-retarding membrane should be installed in accordance with the manufacturer's recommendations.

In our opinion, a coefficient of subgrade reaction, k, of 100 pci can be used to characterize the support with a minimum thickness of 8 inches of "drain rock" (based on a 1x1-foot plate load). However, depending on how the slab load is applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesionless soil:

Modulus of Subgrade Reaction, for $k_s = k\left(\frac{B+1}{2B}\right)^2$ for cohesionless soil,

where: ks = coefficient of vertical subgrade reaction for loaded area;

k = coefficient of vertical subgrade reaction for 1x1 square foot area; and,

B = width of area loaded, in feet.

3.6 PAVEMENT

Prior to pavement construction, the pavement subgrade should be prepared as indicated previously in this report. PSI has provided the following pavement subgrade parameters based on the California Bearing Ratio (CBR) associated with the soils found at the site:

- Native Gravelly Sand Subgrade California Bearing Ratio (CBR) – 10
- Native Gravelly Sand Subgrade Resilient Modulus (MR) – 9,388 psi

PSI has provided the following estimated pavement design parameters based on experience in the general area of the project site with similar subgrade soils. Table 3 below contains our pavement section recommendations.

- Design Life = 20 years
- Reliability = 95%
- Initial Serviceability Index = 4.2 for asphalt, 4.5 for concrete
- Terminal Serviceability Index = 2.5
- Estimated Traffic Volumes
  - Light-Duty – 30,000 ESALs
  - Heavy-Duty – 80,000 ESALs

Table 4 - Recommended Pavement Sections

	FLEXIBLE Light-Duty	**FLEXIBLE Heavy-Duty**	**RIGID**
Asphalt / Concrete Course	3 inches Asphalt	4 inches Asphalt	4 inches Concrete
Gravel Base Course	8 inches	8 inches	6 inches

The recommended pavement sections in Table 4 are based on the AASHTO design methods for flexible and rigid pavement design, and a design life of 20 years. In addition, the ranges also represent typical light-duty and heavy-duty type pavement sections for use in preliminary design.

In heavy truck lanes, it is recommended that rigid concrete pavement be provided. This will provide for the proper distribution of loads to the subgrade without causing deformation of the surface, especially during hot weather.

The construction of new pavements over established granular construction haul routes or staging areas can be accomplished by regarding the existing rock section to remove surficial contamination. Typically, a new 4-inch minimum thickness of 3/4-inch-minus crushed rock base is added to the section to serve as a leveling course beneath the above-recommended thicknesses of asphalt.

Permanent, properly installed drainage is also an essential aspect of pavement design and construction. All paved areas should have positive drainage to prevent ponding of surface water and saturation of the base course. This is particularly important in cut sections or at low points within the paved areas, such as in oil pits. Effective means to prevent saturation of the base course include installing subdrain systems below sunken loading docks and weep holes in the sidewalls of catch basins.

To provide quality materials and construction practices, we recommend that the pavement work conform to the standards used by the Washington State Department of Transportation.

3.7 DESIGN REVIEW AND CONSTRUCTION MONITORING

After plans and specifications are complete, PSI should review the final design and specifications so that the earthwork and foundation recommendations are properly interpreted and implemented. It is considered imperative that the Geotechnical Engineer and/or their representative be present during earthwork operations and foundation installations to observe the field conditions with respect to the design assumptions and specifications. PSI will not be responsible for changes in the project design or project information it was not provided, or interpretations and field quality control observations made by others. PSI would be pleased to provide these services for this project.

4 GEOTECHNICAL RISK AND LIMITATIONS

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed site developments will perform as planned. The engineering recommendations presented in the preceding sections constitute PSI's professional estimate of those measures that are necessary for the proposed building addition to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

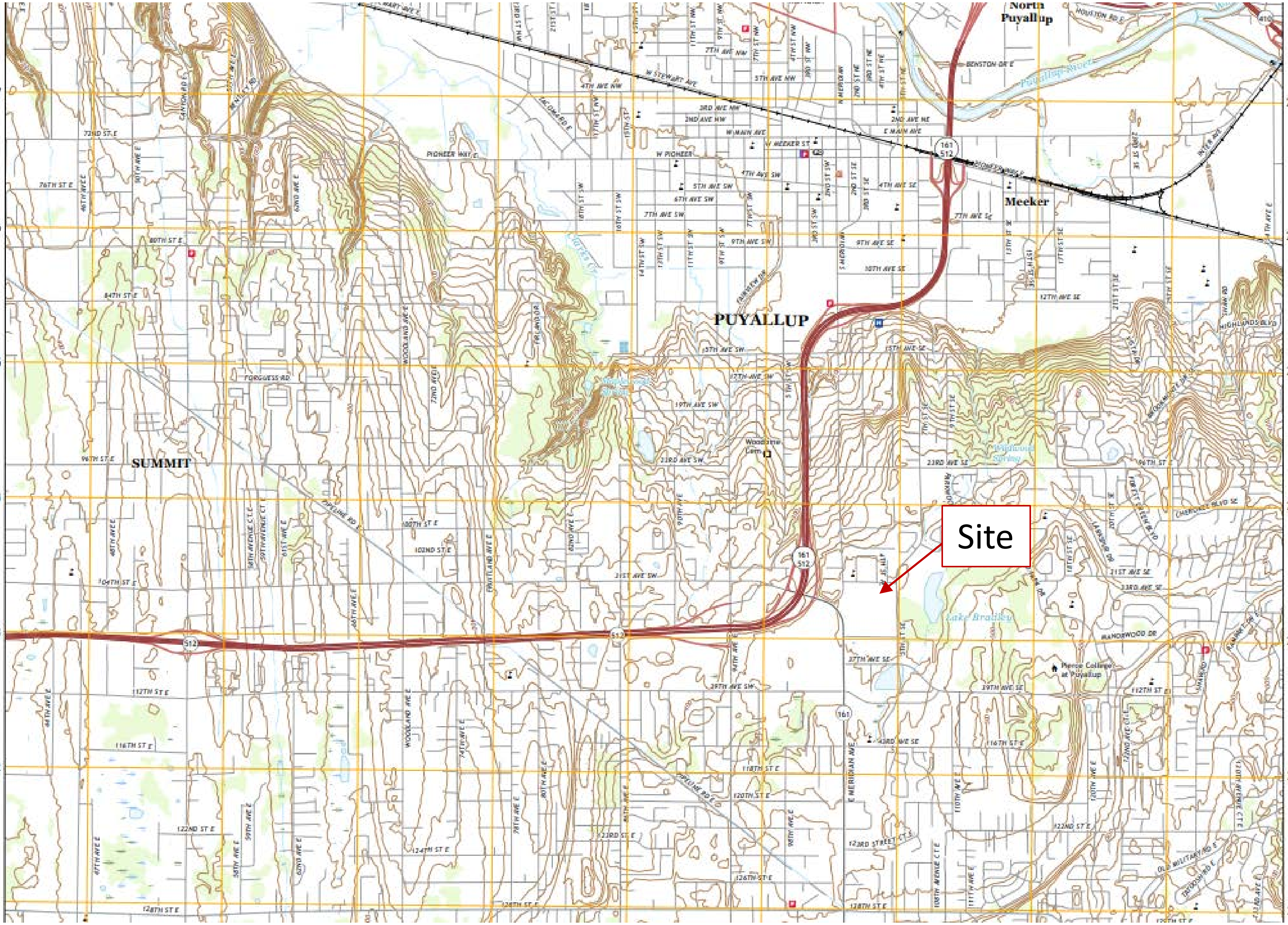
The recommendations submitted are based on the available subsurface information obtained by PSI, and information provided by Galloway. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the recommendations are required. If PSI is not retained to perform these functions, PSI cannot be responsible for the impact of those conditions on the performance of the project.

The Geotechnical Engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Galloway for the specific application to the proposed Walmart Expansion located at 310 31st Avenue Southeast in Puyallup, Washington.

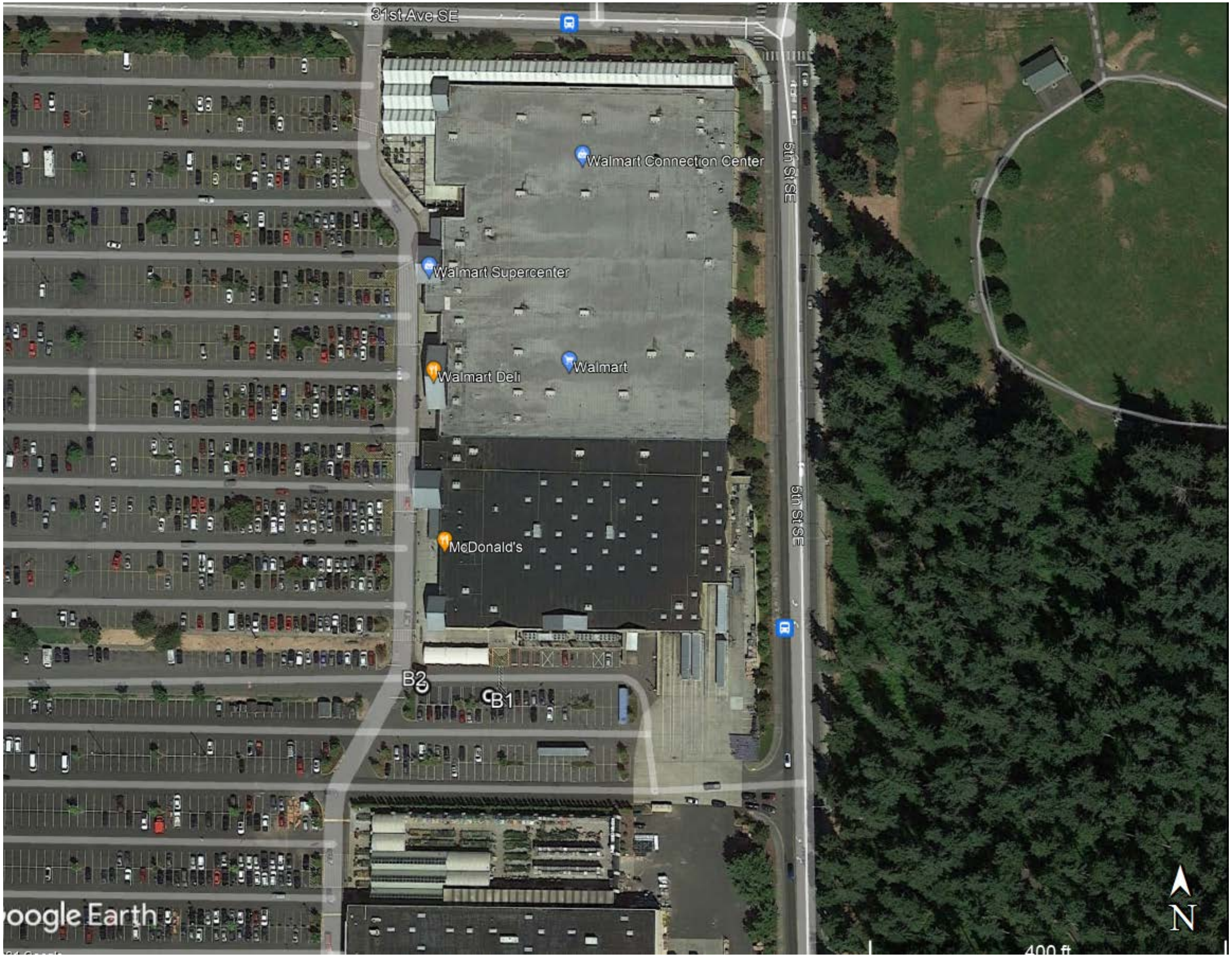
FIGURES

APPENDICES

FIGURES



The National Map published by USGS - Puyallup Quadrangle 7.5-Minute Series, Pierce County	intertek psi	Walmart Store #2403 (Puyallup, WA)	JOB NO.	07041419
		Site Vicinity Map	FIGURE NO.	1



Google Earth Imagery	intertek psi	Walmart Store #2403 (Puyallup, WA)	JOB NO.	07041419
		Investigation Location Map	FIGURE NO.	2

APPENDIX A

FIELD EXPLORATION DISCUSSION AND LOGS

FIELD EXPLORATION PROGRAM

PSI explored subsurface conditions on September 30, 2021. The field exploration consisted of advancing two hollow stem auger borings outside of the southwest corner of the existing building.

Approximate exploration locations are shown on Figure 2, Investigation Location Map. PSI notified the Washington Utility Notification Center to indicate the approximate location of underground utilities in the vicinity of the proposed exploration locations prior to commencing field activities.

A representative from PSI's office observed the drilling and prepared borings logs of the conditions encountered. It should be noted that the subsurface conditions presented on the boring logs are representative of the conditions at the specific locations drilled. Variations may occur and should be expected across the site. The soil morphology represents the approximate boundary between subsurface materials and the transitions may be gradual and indistinct.

Boring Location Selection and Staking

The boring plan was prepared by PSI and approved by Galloway prior to drilling. The approved boring plan was superimposed onto Google Earth™ Imagery and the latitude and longitude were recorded. The approved boring locations were also superimposed onto The National Map developed by USGS, which uses the North American Vertical Datum of 1988 (NAVD88), and the elevations of the boring locations were recorded. The location of the borings in the field were established by hand-held GPS using the coordinates from Google Earth™. The latitude, longitude and elevation are noted on each boring log with the perceived accuracy unknown. If accurate locations and elevations are needed, PSI recommends the client/owner have boring locations and elevations determined by survey methods.

Hollow Stem Auger Borings

Hollow stem auger borings were advanced using a CME-85 track-mounted drill rig owned and operated by Holt Services, Inc located in Vancouver, Washington. Soil samples were recovered at selected depths during drilling using a Split Spoon Sampler driven by a 140-lb weight free falling 30 inches. A standard split spoon sampler with an outside diameter of 2.0 inches and inside diameter of 1.42 inches was used. The number of blows required to drive the sampler 12 inches is designated as the penetration resistance (N-value, blows per foot) and provides an indication of the consistency of cohesive soils and the relative density of granular materials.

Field Classification

Soil samples were initially classified visually in the field. Consistency, color, relative moisture, degree of plasticity, and other distinguishing characteristics of the soil samples were noted. The terminology used in the soil classifications and other modifiers are depicted in the General Notes and Soil Classification Chart.

LABORATORY TESTING PROGRAM AND PROCEDURES

Soil samples obtained during the field explorations were examined in our laboratory. The physical characteristics of the samples were noted, and the field classifications were modified, where necessary. Representative samples were selected during the course of the examination for further testing.

Moisture Content

Natural moisture content determinations were made on selected soil samples in general accordance with ASTM D2216. The natural moisture content is defined as the ratio of the weight of water to the dry weight of soil, expressed as a percentage. Results are shown on the exploration logs.

Visual-Manual Classification

The soil samples were classified in general accordance with guidelines presented in ASTM D2487. Certain terminology incorporating current local engineering practice, as provided in the Soil Classification Chart, is included with, or in lieu of, ASTM terminology. The term which best described the major portion of the sample was used in determining the soil type (i.e., gravel, sand, silt or clay). Results are shown on the exploration logs.

Sieve Analysis

The determination of the amount of material finer than the U.S. Standard No. 200 (75-µm) sieve was made on selected soil sample in general accordance with ASTM D1140. In general, the sample was dried in an oven and then washed with water over the No. 200 sieve. The mass retained on the No. 200 sieve was dried in an oven, and the dry weight recorded. Results from this test procedure assist in determining the fraction, by weight, of coarse-grained and fine-grained soils in the sample. Results are shown on the exploration logs.

The determination of the gradation curve of the coarse-grained material was made on selected soil samples in general accordance with ASTM D6913. In general, the oven dried mass retained on the No. 200 sieve is passed over progressively smaller sieve openings, by agitating the sieves by hand or by a mechanical apparatus. The mass retained on each sieve is recorded as a fraction of the total sample, including the percent passing the No. 200 sieve. Results are shown on the Grain Size Analyses below.

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
RC: Rock Core
TC: Texas Cone
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼: Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated

Description	Criteria
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

BORING B1

DATE STARTED:	9/30/21	**DRILL COMPANY:**	Holt Services Inc
DATE COMPLETED:	9/30/21	**DRILLER:** John	**LOGGED BY:** Brandon
COMPLETION DEPTH	26.5 ft	**DRILL RIG:**	CME-85
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	137 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	47.16°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-122.2892°	**EFFICIENCY**	88%
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	SRS

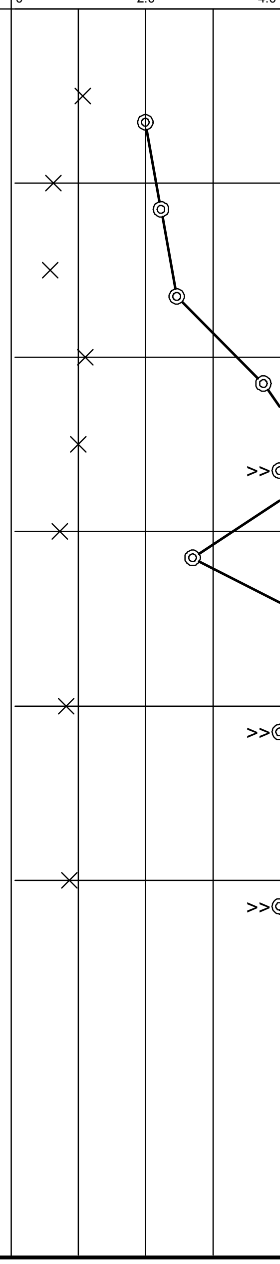
Water		
∇	While Drilling	18 feet
▼	Upon Completion	feet
∇	Delay	N/A

BORING LOCATION:

REMARKS: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633.

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
137	0			**Approximately 3 inches of ASPHALT**				
				Approximately 3 inches of BASE ROCK				
135				Brown to gray, medium dense to very dense **Poorly Graded Gravelly SAND**, moist, trace silt			13	Fines=2.8%
		1	14			7-13-4 N_{60}=25		
	5	2	8			11-10-9 N_{60}=28	8	
130		3	8			8-11-10 N_{60}=31	7	
	10	4	10			5-6-26 N_{60}=47	14	
125		5	4		SP	18-19-21 N_{60}=59	13	
	15	6	4			8-12-11 N_{60}=34	9	
120				∇ Wet below 18 feet				
	20	7	6			6-24-42 N_{60}=97	10	
115								
	25	8	6			24-34-39 N_{60}=107	11	Fines=0.3%
				Boring terminated at 26.5 feet bgs				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0



Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97219
Telephone: (503) 289-1778

PROJECT NO.: 07041419
PROJECT: Walmart Superstore No. 2403 Expansion
LOCATION: 310 31st Avenue Southeast
Puyallup
Washington

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B2

DATE STARTED:	9/30/21	**DRILL COMPANY:**	Holt Services Inc
DATE COMPLETED:	9/30/21	**DRILLER:** John	**LOGGED BY:** Brandon
COMPLETION DEPTH	26.3 ft	**DRILL RIG:**	CME-85
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	137 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:	47.16°	**HAMMER TYPE:**	Automatic
LONGITUDE:	-122.2895°	**EFFICIENCY**	88%
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	SRS

Water

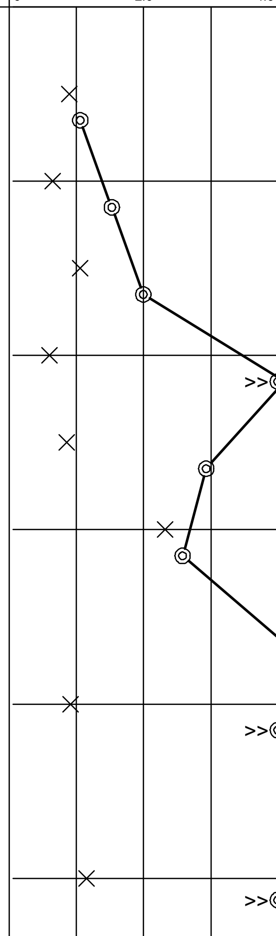
While Drilling	18	feet
Upon Completion		feet
Delay		N/A

BORING LOCATION:

REMARKS: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633.

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
137	0			**Approximately 3 inches of ASPHALT**				
				Approximately 3 inches of BASE ROCK				
135				Brown to gray, medium dense to very dense **Poorly Graded Gravelly SAND**, moist, trace silt	SP		11	
		1	4			6-5-4 N_{60}=13		
	5	2	4			9-7-6 N_{60}=19	8	
130		3	6			3-7-10 N_{60}=25	13	Fines=0.7%
	10	4	5			6-7-28 N_{60}=51	7	
125		5	3			10-11-14 N_{60}=37	11	
	15	6	6			10-10-12 N_{60}=32	29	
120				Wet below 18 feet				
	20	7	10	Gray, very dense **Poorly Graded Sandy GRAVEL**, wet, trace silt	GP	8-20-28 N_{60}=70	11	Fines=0.5%
115	25	8	8			36-43-50/3" N_{60}=136	14	
				Boring terminated at 26.5 feet bgs				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0



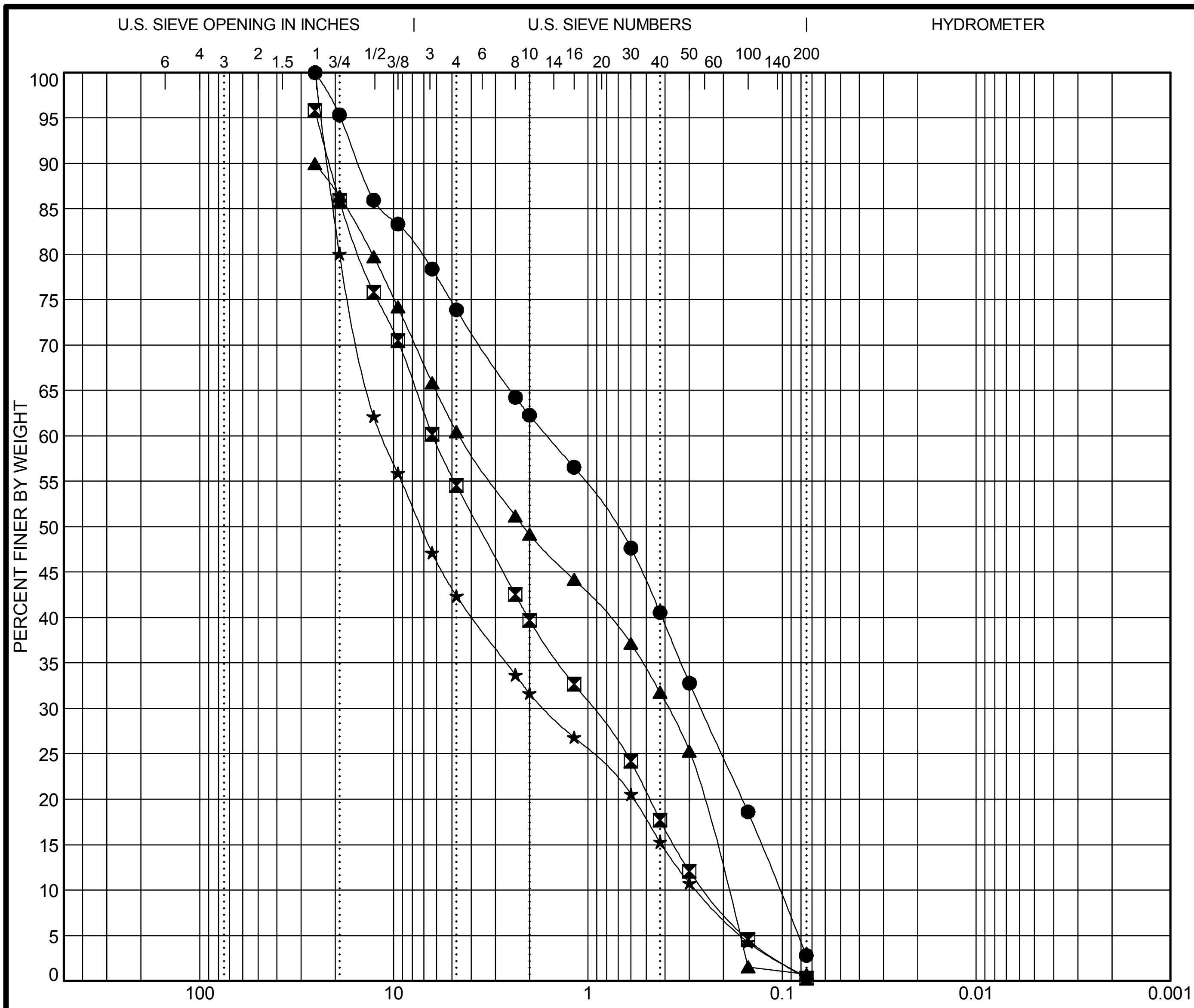
intertek psi

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97219
Telephone: (503) 289-1778

PROJECT NO.: 07041419
PROJECT: Walmart Superstore No. 2403 Expansion
LOCATION: 310 31st Avenue Southeast, Puyallup, Washington

The stratification lines represent approximate boundaries. The transition may be gradual.

APPENDIX B
LABORATORY TESTING PROGRAM



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B1**	**2.5**	**Poorly Graded Gravelly SAND**				**0.41**	**15.76**
⊠	**B1**	**25.0**	**Poorly Graded Gravelly SAND**				**0.59**	**25.36**
▲	**B2**	**7.5**	**Poorly Graded Gravelly SAND**				**0.17**	**23.90**
★	**B2**	**20.0**	**Poorly Graded Sandy GRAVEL**				**0.88**	**41.62**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B1**	**2.5**	**25.4**	**1.621**	**0.262**	**0.103**	**26.1**	**71.1**	**2.8**	
⊠	**B1**	**25.0**	**25.4**	**6.285**	**0.955**	**0.248**	**41.3**	**54.2**	**0.3**	
▲	**B2**	**7.5**	**25.4**	**4.588**	**0.386**	**0.192**	**29.5**	**59.7**	**0.7**	
★	**B2**	**20.0**	**25.4**	**11.504**	**1.669**	**0.276**	**57.6**	**41.9**	**0.5**	

Professional Service Industries, Inc.
6032 N. Cutter Circle, Suite 480
Portland, OR 97219
Telephone: (503) 289-1778
Fax: (503) 289-1918

GRAIN SIZE DISTRIBUTION

Project: Walmart Superstore No. 2403 Expansion
PSI Job No.: 07041419
Location: 310 31st Avenue Southeast
Puyallup

GEOTECHNICAL INVESTIGATION FACT SHEET

Include this form in the Geotechnical Report as an Appendix.

PROJECT LOCATION: 310 31st Avenue Southeast, Puyallup, Washington

Engineer: Steve Bryant, PE Phone #: 503-289-1778

Geotechnical Engineering Co.: Professional Service Industries, Inc. Report Date: 10/20/2021

Ground Water Elevation: 18 feet below grade Fill Soils Characteristics: Not Encountered
(If encountered)

Date Groundwater Measured: 9/27/2021 Maximum Liquid Limit: Non-Plastic

Topsoil/Stripping Depth: None / Asphalt Encountered Maximum Plasticity Index: Non-Plastic

Undercut (If Required): None Specified Compaction: 95% of ASTM 1557

Standard Proctor Results: (Attach plots.) Not Tested Moisture Content Range: +/- 2% of ASTM 1557

pH: Not tested, see original geotechnical report

Corrective actions required for construction based on pH level noted: See original geotechnical report

Resistivity: Not tested, see original geotechnical report

Corrective actions required for construction based on resistivity level noted: See original geotechnical report

Cement Type: See original geotechnical report

Recommended local DOT subbase/base material (reference section plan in Foundation Subsurface Preparation):

3/4"-0 Aggregate Rock

Recommended Compaction Control Tests:

1 Test for Each 2,000 Sq. Ft. each Lift (bldg. area)
1 Test for Each 4,000 Sq. Ft. each Lift (parking area)

Structural Fill Maximum Lift Thickness 8-12 in. (Measured loose)

Subgrade Design CBR value = 10.

COMPONENT	ASPHALT Standard	ASPHALT heavy	CONCRETE standard	CONCRETE heavy
Stabilized Subgrade (If Applicable)	-	-	-	-
Base Material (Stone, Sand/Shell, etc.)	8	9	-	6
Asphalt Base Course	3	4		
Leveling Binder Course	-	-		
Surface Course	-	-	-	5

NOTE: This information shall not be used separately from the geotechnical report.

FOUNDATION DESIGN CRITERIA

Include this form in the Geotechnical Report as an Appendix.

PROJECT LOCATION: 310 31st Avenue Southeast, Puyallup, Washington

Engineer: Steve Bryant, PE Phone #: 503-289-1778

Geotechnical Engineering Co.: Professional Services Industries, Inc Report Date: 10/20/2021

Foundation type: Shallow Foundations

Allowable bearing pressure: 3,000 psf

Factor of Safety: 3

Minimum footing dimensions: Individual: 36 Continuous: 18

Minimum footing embedment: Exterior: 18 Interior: 12

Frost depth: 18

Maximum foundation settlements: Total: <1 Inch

Differential: <1/2 Inch

Slab: Potential vertical rise: None

Capillary Break (not a vapor barrier) describe: 8 inches of angular free draining rock

Subgrade reaction modulus: 100 psi/in Method obtained: Estimated

Active Equivalent Fluid Pressures No Walls Planned

Passive Equivalent Fluid Pressures 300 pcf

Perimeter Drains (describe): Building: None Recommended
Retaining Walls : No Walls Planned

Retaining Wall: At rest pressure: No Walls Planned
Coefficient of friction: .40

COMMENTS:

SITE BUILDING AREA-FOUNDATION SUBSURFACE PREPARATION
WAL–MART- JOB #07041419,
PUYALLUP, WASHINGTON
11/1/21

UNLESS SPECIFICALLY INDICATED OTHERWISE IN THE DRAWINGS AND/OR SPECIFICATIONS, THE LIMITS OF THIS SUBSURFACE PREPARATION ARE CONSIDERED TO BE THAT PORTION OF THE SITE DIRECTLY BENEATH AND 5 FEET BEYOND THE BUILDING AND APPURTENANCES.

APPURTENANCES ARE THOSE ITEMS ATTACHED TO THE BUILDING PROPER (REFER TO DRAWING SHEET SP1), TYPICALLY INCLUDING, BUT NOT LIMITED TO, THE BUILDING SIDEWALKS, GREENHOUSE CANOPIES, PORCHES, RAMPS, STOOPS, TRUCK WELLS/DOCKS, CONCRETE APRONS AT THE AUTOMOTIVE CENTER, COMPACTOR PAD, ETC. APPURTENANCES SHALL ALSO INCLUDE SCREENWALLS AT THE COMPACTOR, TRUCK DOCK AND THE BALE/PALLET STORAGE AREA(S). THE INTERIOR SLAB-ON-GRADE BASE AND THE VAPOR BARRIER, WHERE REQUIRED, DO NOT EXTEND BEYOND THE LIMITS OF THE ACTUAL BUILDING.

ESTABLISH THE FINAL SUBGRADE ELEVATION TO ALLOW FOR THE CONCRETE SLAB, BASE, AND SUBBASE REFERENCE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR REQUIRED SLAB THICKNESS.

EXISTING FOUNDATIONS, SLABS, PAVEMENTS, AND BELOW-GRADE STRUCTURES SHALL BE REMOVED FROM THE BUILDING AREA. REMOVE SURFACE VEGETATIONS, TOPSOIL, ROOT SYSTEMS, ORGANIC MATERIAL, EXISTING FILL, AND SOFT OR OTHERWISE UNSATISFACTORY MATERIAL FROM THE BUILDING AREA. PROOFROLL EXPOSED SUBGRADE. REMOVE AND REPLACE UNSATISFACTORY AREAS WITH SATISFACTORY MATERIAL.

THE SITE SHALL BE STRIPPED OF EXISIING PAVEMENT AND PROOF ROLLED FOR EXCESSIVE SOFT SPOTS. THE STRUCTURAL FILL MAY HAVE TO BE IMPORTED AND SHALL MEET THE STRUCTURAL FILL GRADATIONS AS DESCRIBED IN SECTION 3.4 OF THIS REPORT. NATIVE NEAR SURFACE SOILS MAY BE USED FOR STRUCRUAL FILL

SUBGRADE MATERIAL SHALL BE PLACED IN LOOSE LIFTS NOT EXCEEDING 8-12 INCHES IN THICKNESS AND COMPACTED TO AT LEAST 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM 1557 AT A MOISTURE CONTENT WITHIN 2 PERCENT BELOW TO 2 PERCENT ABOVE THE OPTIMUM.

THE FOUNDATION SYSTEM SHALL BE ISOLATED SPREAD FOOTINGS AT COLUMNS AND CONTINUOUS SPREAD FOOTINGS AT WALLS.

THIS FOUNDATION SUBSURFACE PREPARATION DOES NOT CONSTITUTE A COMPLETE SITE WORK SPECIFICATION. IN CASE OF CONFLICT, INFORMATION COVERED IN THIS PREPARATION SHALL TAKE PRECEDENCE OVER THE WAL-MART SPECIFICATIONS. REFER TO THE SPECIFICATIONS FOR SPECIFIC INFORMATION NOT COVERED IN THIS PREPARATION. THIS INFORMATION WAS TAKEN FROM A GEOTECHNICAL REPORT PREPARED BY INTERTEK PSI, DATED OCTOBER 20, 2021 (GEOTECHNICAL REPORT IS FOR INFORMATION ONLY AND IS NOT A CONSTRUCTION SPECIFICATION).